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MASTER

THE GATLINBURG CONFERENCE: BAROMETER OF PROGRESS IN ANALYTICAL CHEMISTRY

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ABSTRACT

Much progress has been made in the field of analytical chemistry over the past twenty-five years. The AEC-ERDA-DOE family of laboratories contributed greatly to this progress. It is not surprising then to find a close correlation between program content of past Gatlinburg Conferences and developments in analytical methodology. These Conferences have proved to be a barometer of technical status.

INTRODUCTION

Analytical chemists have made a tremendous amount of progress in the last quarter-century, and we in the energy technology field have contributed much to that progress. We have come to know, and in some cases even become, leaders in the field. I believe that the Gatlinburg Conferences have had a significant role in communicating personal as well as technical growth in our discipline during this time period. My theme is that the programs of the Conferences should serve as a rough barometer of progress within the field of analytical chemistry. Accordingly, this paper will reflect on the past 25 years in analytical chemistry--particularly in the analytical chemistry of energy technology--through the programs of the Gatlinburg conferences. It has not been an easy paper to prepare, but it has been fun. It is likely to be a bit nostalgic and a bit editorial.

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THE THREE PHASES OF GATLINBURG PROGRAMS

The programs of this Conference over the past 25 years, like all Gaul, can be divided into three parts. The initial part was a period of Contacts and Communication extending from 1957 to 1964. To appreciate this, recall that in the early 1950's much work had been done at a number of AEC laboratories, but little had been openly communicated. Lack of communication was built into the system in those days. The Gatlinburg Conference was initiated in 1957 because some far-sighted men--like Myron Kelley, Jim White, Clem Rodden, Charlie Metz, and others--realized that much good could result from improved communication among analytical chemists in the family of AEC laboratories. The objective was to get to know each other and how the various laboratories solved common technical problems. It is not surprising then to find (Fig. 1) problem-oriented sessions that deal with the analytical chemistry of U, Th, rare earths at the very outset of the Conference. Boron, plutonium, burnup, etc. appear in subsequent years. Similarly, technique or discipline-oriented topics (Fig. 2) begin to appear early, and they reflect the primary tools of the times: emission spectrometry, polarography, nucleonics, mass spectrometry and so on. During this chapter in the history of the Conference, the programs largely dealt with common problems and techniques. The thrust was what was known and how things got done, attempting to improve everyone's level of awareness.

The second chapter in the Conference history begins about 1965 and extends through 1971. I label it the "Keeping Current" phase of the Conference. By this time, the need for getting acquainted and informing each other had diminished. The thrust of the programs moved toward what we would now call "current awareness". Programs became more general in nature and began to include topics that were of potential benefit to the AEC community of laboratories. Problem-oriented topics such as Pure Materials Research, Environmental Analysis, and Purity of Reagents appeared for the first time. Among the discipline-oriented sessions, Automated Analysis, Ion Selective Electrodes, Computers in Germanium Spectroscopy, and Chromatography are first-timers.

Chapter 3 begins in 1971 and extends through today. These were times of great change: changes in administrations, organizations, priorities, technology, communication, and so on. There was an almost explosive growth in available meetings and conferences and workshops, so that the Gatlinburg Conference began to feel real competition. Also, a second generation of participants began to appear at the Conferences in the early seventies. Thus, in 1971 and only then, the program was devoted to a review of activities within the various

AEC laboratories. This was in response to a perceived need to re-inform each other about the then-current activities. Topics with a problem-orientation included Analytical Costs, Safeguards, NURE, On-Line Monitoring and Organic Pollutants. Discipline-oriented sessions included as first-timers Lasers in Analytical Chemistry, Multielement Analysis and Multispectral Detectors, and Ion Chromatography--all forefront subjects at the time. Hence, Chapter III has been a time when the Conference responded to Special Needs in times of great change. Several of the discipline-oriented sessions were anticipatory in nature, i.e., they dealt with topics that could or should benefit the participating laboratories, whether they were active in the particular technical area or not.

In retrospect then, we see that the Gatlinburg Conference has grown through three rather distinct phases, each with a rather different mission. It began as a way to acquaint people from within the nuclear family of Laboratories with each other, and to encourage the exchange of information about how they performed and solved problems within the nuclear field. As time went on, this same group of people began to see the Gatlinburg conference as a way of keeping current in analytical chemistry itself, as utilized within the nuclear field. The third phase was one in which the Conference became a device for communicating with each other about special needs and current research that might be of use to analytical people who work in the <u>energy field</u> in general, not just the nuclear energy field. The next question is obvious: will there be a Chapter IV and what will it be like?

Chapter IV?

Earlier, it was suggested that the Gatlinburg programs could be divided into three parts. It was tempting to name those parts AEC, ERDA and DOE. If that had been done, then a future Chapter IV would be question mark because DOE may be dismantled. Analytical chemistry is central to experimental work, however, and hence is likely to continue to be a prominent discipline, regardless of agency name or mission. We must consider the prognosis for analytical chemistry in the energy field before we can project a Chapter IV for the Conference. The outlook appears to be one of continuing-but-tight support for research: long-term research. Thus, there are three real questions that we have to face. One is very important, namely, will analytical chemistry be considered a discipline worthy of research support in these competitive times? Related to that is question two--what research and development must be done or is best done at national laboratories? (This is both a general question and a specific one, insofar as analytical chemistry is concerned.) The third question is how can we be most effective in the programs that come to our respective laboratories? I suggest that the well-known state equation can be applied to at least the third question:

$$PV = nRT$$

In the present context, however, P = inflationary pressure, V = value rendered, n = information (not data) provided, R = responsiveness and T = technology. Basically, this says that in times when inflationary pressure tends to hold things down, we have to increase the value of our work, and this can be done by taking advantage of new technology so that we can provide needed information in a very responsive manner.

With respect to the first question, I believe we need to toot our own horn a bit. Traditionally, analytical people have assumed that others recognize and appreciate our contributions; we have tended to be silent and let others take the glory at times. Many people do appreciate our contributions, but many others simply assume that the means for making any kind of measurement already exists. This is tantamount to saying that there is really no jusitifaction for sponsoring analytical research or development. Therefore, I think that we analytical chemists should brag a bit. When we devise a means for measuring ultra low-level contaminants in a traveling wave tube and thereby save the life of a $100M satellite, then I think we should brag about it. When we, through careful meticulous chemistry, establish the compound or compound class that is responsible for crickets growing two heads when their larvae are exposed to hazardous materials, then I think we should brag about it. When we develop a new concept that enables us to study and measure extremely radioactive solutions remotely, and then work with engineers to convert that concept into an operating instrument, then we should brag about our contribution. It is going to be a competitive world for the next ten years, and we can compete, but we need to be a bit more assertive about the value of what we do.

With respect to the second question, it is clear that we should stress the technical work that we do best and/or uniquely. Examples are radiochemistry, the use of stable- and radioisotopes, actinides chemistry, hot cell chemistry, safeguards and accountability studies, remote instrumentation, waste management, and so on. In these technical areas we should be able to compete well for research funds with both academia and industry. In fact we should work toward an increased educational role insofar as these technical areas are concerned.

Now, what is going to be the thrust of the Gatlinburg Conference over the next chapter in its history? First, I believe that communication among the analytical chemists within the family of national laboratories will continue to be a high priority feature of the programs. In this, the Gatlinburg conferences are unique. Secondly, the programs will stress topics that reflect a certain uniqueness within the energy technology field and especially the nuclear technology field. Thirdly, the Gatlinburg programs are likely to assume a bit more of anticipatory flavor. We in the analytical chemistry business try to anticipate needs and to prepare for them before they become urgent. We do that as a matter of good business practice, but we usually prefer to talk publicly about what has been done. The Gatlinburg conference offers a means for discussing immediate and future problems. One example: a group of representatives from various laboratories has met informally during the past two Gatlinburg Conferences to discuss technetium chemistry and various techniques for determining technetium. They will meet again this year. This began as an anticipatory thing and has proved to be a successful addendum to the Conference. Fourthly, the Conference is likely to maintain the tradition of presenting current methodology and instrumentation that is of particular interest to those that work in the nuclear energy field. Fifth, some of the topical workshops that are now held around the country for DOE people are likely to be held in conjunction with the Gatlinburg conference. Simple economics, if nothing else, favors this move. Finally, the Conference is likely to incorporate an educational function into the program by inclusion of tutorial sessions and perhaps short courses within the program.

It is interesting to ask the question: if the Gatlinburg Conference really serves as a barometer of progress in analytical chemistry, then what does this year's program tell us? To answer this question, it is necessary to peruse titles of papers rather than titles of sessions. Then, one sees as problem-oriented subjects National Standards for the Nuclear Industry, responsive analytical chemistry (via Three-Mile Island discussions), decommissioning/decontamination assessments, and characterization of materials at the microstructural level. Technique-oriented subjects include automated chemical analysis operations, the use of fiber optics, remote spark source mass spectrometry, secondary ion mass spectrometry, and laser-Raman microprobe spectrometry. There are rather firm implications in these topics. It is notable that a Poster Session is incorporated into the program this year for the very first time. I expect to see increased scheduling of Poster Presentations at Gatlinburg in the future, and I want to use it as an adjunct to this lecture.

CONCLUSION

This paper has considered the development of the Gatlinburg Conference over the past quarter-century. Emphasis has been placed upon the technical aspects of past programs, but mention was made of the personal aspects of the meetings. People like Dr. Furman, Dr. Willard, Dr. Seaborg, Dr. Hallet, Dr. Laitinen, Dr. Morrison, Dr. Milner, Dr. Florence have participated in these Conferences. Many lasting friendships and many collaborations have been developed here. Close personal contact has been a primary characteristic of past Conferences. We hope it will remain so for years to come.

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LIST OF FIGURES

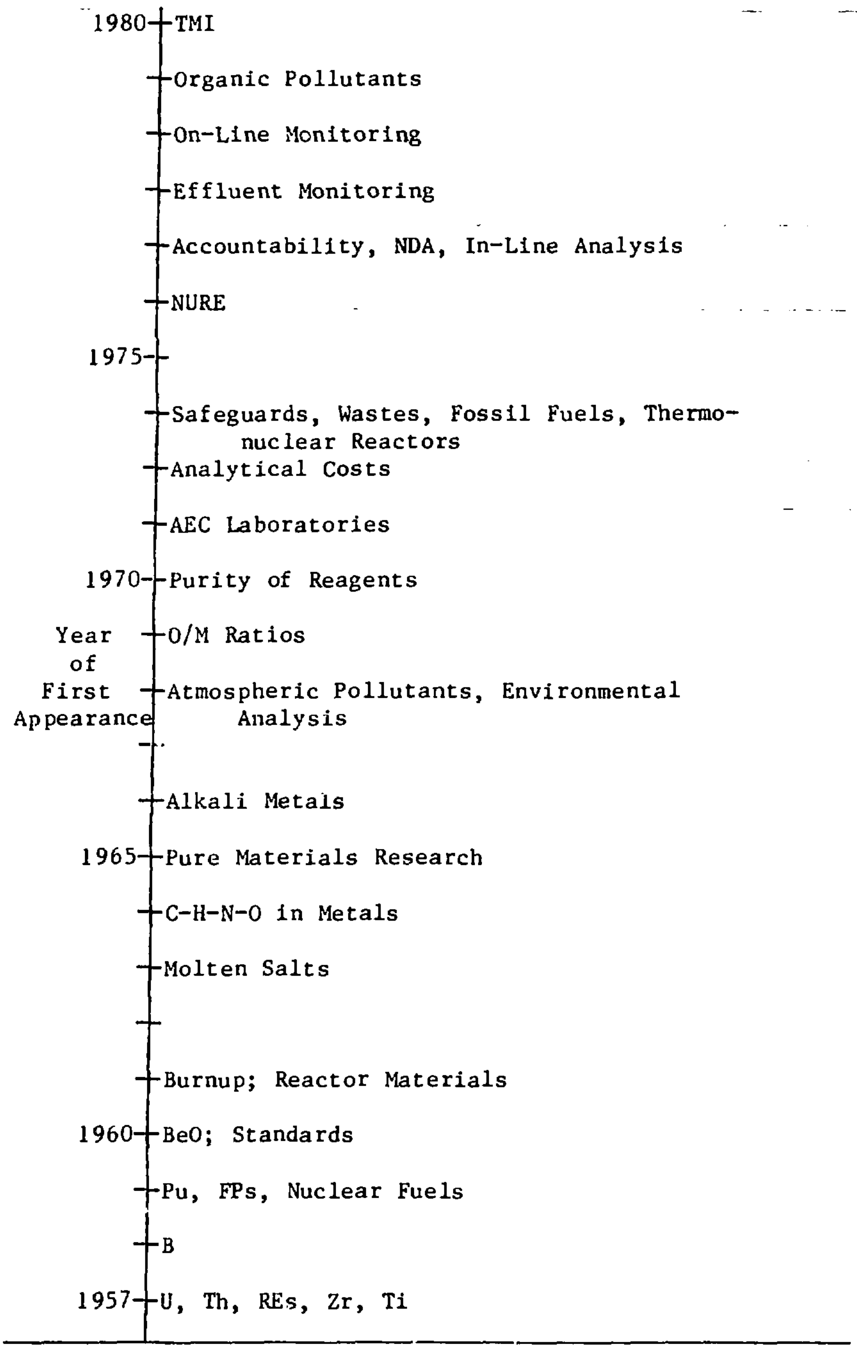

Fig. 1. Problem-Oriented Sessions at Gatlinburg

1980

Ion Chromatography, Surface Analysis

In-Line Analysis

1975

Multi-element Analysis & Detectors

Lasers, Ion Microprobe Mass Spectrometry

Photoelectron Spectroscopy; Chromatography

1970 Digital Computers; Sensors & Detectors; Purity of Reagents

Computers in Ge Spectroscopy

Year of First Appearance

Automated Analysis; Non-reactor AA; Ion Selective Electrodes; Thermal Analysis; Electrochemistry

Remote Analysis in Hot Cells

1965

Separations; Liquid Scintillation Counting

Instrumentation (Nuclear, Electrochemical); Gas Chromatography

Atomic Absorption; Mass Spectrometry; Use of Isotopes

Spectral Methods

1960 Activation & Radiochemical Methods; Standards; Remote Instrumentation

X-Ray & Emission Spectrometry; Flame Photometry; Polarography; Nucleonics

1957

Fig. 2. Discipline-Oriented Sessions at Gatlinburg